

DRAFT: Can governance networks be forums for a reconstruction of the boundaries between the sciences and society?

Abstract

A number of technological developments have in recent years met with open opposition from members of the public. In political statements this opposition is mainly ascribed to public distrust in scientific institutions and political elites, but by researchers also to lack of self-reflexivity within research institutions and a mistaken construction of 'science' as sole providers of facts whereas 'the public' provide 'only' values. In this paper public opposition is considered a symptom of undemocratic practises in science dependent policy making. Politically, the preferred solution to public opposition and to democratise the sciences is to involve the public more in decision-making processes.

Researchers have blamed scientific institutions and political elites for a persistent inability to recognise the intermingling of science and society in a modern world, making it impossible to understand public opposition and scepticism towards science, and thereby they have identified a need to re-construct what is a proper relationship between scientific institutions, citizens, policy-makers and our natural and cultural environment if we are to democratise the sciences in environmental decision-making and have meaningful public involvement.

This paper explores the possibilities of governance networks to be venues for such a reconstruction drawing on science and technology studies and political theory.

Keywords

Public understanding of science, science-policy relationships, boundaries, democratic decision-making, natural resource management

Introduction

The relationship between the sciences, policy-makers and the public has been discussed from various perspectives in academic literature for at least 40 years (e.g. Irwin and Michael, 2003;

Weingart, 2002; Weinberg, 1972) but the discussion has lost none of its relevance. The sciences and their technologies profoundly affect the everyday lives of citizens, not least because of the risks and uncertainties technologies impose (Beck, 1997; Giddens, 1994). Regarding the management of natural resources many issues are put on, an needs to be put on the agenda by scientists as they are not readily visible (Weingart, 1999; Beck, 1997); climate change being one of the most prominent example at present, but also biodiversity decline, the use of genetically modified crops, etc. The sciences thus play a prominent and active role in environmental policy making (Fischer, 2000). Furthermore, a sustainable management of natural resources is a complex matter where many of the relationships between humans and the environment and the natural interactions in ecosystems are only sparingly understood and decisions must therefore be made under conditions of uncertainty (Engels, 2005; Fischer, 2000; Ravetz, 1999). Therefore expertise and research are both necessary and unavoidable ingredients in policies of natural resource management.

However, as Wynne (1989) convincingly showed in his case study of the Cumbrian sheepfarmers after the Chernobyl fallout, there is necessary expertise to be found outside of the scientific institutions, which should not be ignored. Ordinary citizens do have something to offer in terms of local knowledge and experience in environmental matters (Fischer, 2000). Policy makers are now challenged to find the best ways to incorporate knowledge of different types and from different sources into policy decisions, keeping in mind that knowledge is a social process not merely a product (Pregernig, 2007; Shannon et al, 2007; Hagendijk, 2004; Collins and Evans, 2002).

Apart from being able to qualify decisions, public participation is called for to democratise science based policy decisions and thereby to counteract opposition towards the sciences. Members of the public have openly expressed scepticism towards political elites and science, in particular regarding phenomena which are not readily visible and associated with unquantifiable risk. For example, according to the newspaper "Information" the Danish population is divided: on the one hand there is the upper-class where there is a consensus that a significant percentage of climate change are caused by humans and that immediate action is needed. On the other hand there is the lower-class where there is an outspoken mistrust against the elite and an increasing scepticism concerning if climate change is really manmade (Lavrsen, 2009). More outspoken scepticism has been displayed in the form of demonstrations regarding genetically modified crops, the application of nuclear power and depositing of nuclear waste (Irwin and Michael, 2003; UK House of Lords, 2000). This scepticism is ascribed to lacking knowledge as well as distrust in scientific and political institutions, and the political response has been increased public participation in various forms (Blok, 2007;

Irwin and Michael, 2003; European Commission, 2001; UK House of Lords, 2000). However, the deeper causes of public scepticism have not been properly understood, which in turn has led to misconceived approaches to public participation where science provides only facts and the public only values (Wynne, 2006; Irwin and Michael, 2003).

This scepticism along with other barriers to the interaction between the sciences and politics may be problematic: for politicians because they may lose a source of legitimacy and may not get the information they need; for scientists it may be problematic because available knowledge is not used (Cash et al, 2002), and for the public it may be problematic if the political response is for show exercises of participation in which citizens are constructed as deficient and in need of information rather than contributors of substantive knowledge (Irwin, 2001).

Collins and Evans (2002) argue that a re-institutionalisation of the science-policy relationship is needed. While it was necessary to extend so-called technical decision-making beyond technical elites to increase legitimacy of decisions, the expansion has in turn created a problem of extension, by dissolving the boundaries between experts and public to an extent where there are no means by which to distinguish legitimate rights to be involved from illegitimate rights. What is needed is to disentangle expertise from political rights and to build new categories of both expertise and sciences. Latour (2004) on the other hand argues that expertise should become more politic. What is needed is a different construction of nature and society that dissolves the object-subject dichotomy and does not allow for 'facts' to short-circuit the political and undermine democracy.

Building on insights from science and technology studies and political theory this paper addresses the relationships between policy makers, scientists and members of the public in relation to natural resource management and the role governance networks may be able to play in reconstructing this relationship.

The relationship between the sciences, politics and the public

In the 60s the role of science and expertise in politics was considered in the light of technocratic ideals and a conception of science as speaking truth to power. Policy making was conceived as a linear and rational process in which problems were encountered, the sciences were consulted and found rational solutions which were then transmitted to politics as a finished product of objective facts (Pregernig, 2007; Böcher et al, 2005). Although this model at an early stage was recognised to correspond poorly with empirical reality, its remnants are still present in the perceptions of policy-

makers and scientists (Böcher et al, 2005; Weingart, 1999). Later models of the relationship between the sciences and politics focus on scientific knowledge as a political resource to achieve desired ends, to legitimize policy, to justify unpopular decisions or to delay action (Boehmer-Christiansen, 1994), and on the contingent construction of boundaries between pure science and politics, and of science-policy hybrids (Ravetz, 1999; Weinberg, 1972). These constructions enable the sciences to protect themselves from the biases of politics, and policy-makers to make use of the legitimising functions of the sciences as a resource (Pregernig, 2007; Jasanoff, 1987). In order for communication to occur across these boundaries, boundary organisations are helpful. Boundary organisations are located at the frontier of two different social worlds, and here participants from both sides of the boundary can meet (Cash et al, 2002).

The above mentioned models do not offer much room for citizens apart from electing the politicians. However, as citizens began to question the results of the interactions of scientific and political elites and their technocratic procedures, they gained foothold as an important part of the relationship. In the first studies of the public understanding of science, also known as the first wave of science studies (Collins and Evans, 2002), the dominant view on the relationship between the sciences and the publics was the so-called cognitive deficit model. The quantitative surveys employed to investigate the public understanding of science showed that the publics were scientifically illiterate at least according to the criteria these surveys employed. An underlying assumption was that increased general public understanding of science would lead to increased acceptance of science (Irwin and Michael, 2003). The second wave of science studies was more ethnographic and showed that science is a social process that imbues 'facts' with values, and also that non-scientists are fully capable of understanding and contributing to the knowledge of scientific institutions if the science relate to their everyday lives (e.g. Collins and Pinch, 1998). I.e. ordinary members of the public are not cognitively deficient per se. Furthermore, surveys showed that increased scientific knowledge does not necessarily lead to increased acceptance of the actions of political and scientific elites (Irwin and Michael, 2003).

In fact a number of technological developments have in recent years met with open opposition from members of publics in countries where the surveys showed sound scientific literacy (Irwin and Michael, 2003). In political statements public opposition is mainly ascribed to public distrust in risk assessment and management as well as possible ethical ramifications of using the new technologies. The preferred solutions to public opposition is to involve the public more in the decision-making process, address ethical concerns explicitly, openly communicate the uncertain aspects of new

technologies, and improve science education and the ability of scientists to communicate their research. In this way political processes depending on scientific expertise is to be democratised (European Commission, 2001; UK House of Lords, 2000). Politics dealing with the management of natural resources generally depend on scientific expertise, so this endeavour is highly relevant for this policy field.

In the following, I will first address what the acclaimed lack of trust stems from, then I will argue that the construction of facts belonging to the science side of the boundary, while the public contribute with only values is much to blame. Science and technology studies offer us some ideas to how the fact-value separation can be reconstructed, and thereby offer insights in how the diverse actors involved in natural resource management can interact in a more democratic manner. Finally, I will consider if governance networks can be of help in this regard.

Why is there a lack of trust?

Trust may be important for members of the public to support scientific endeavours, but trust in what? Or more accurately; what is it in the science-public relationship that causes the alleged mistrust? Is the cause the insufficient transparency of traditionally closed venues of technical decision-making, general increased scepticism towards authorities and a chasm between public perceptions of acceptable risk and scientific, objective risk assessment which seem to be the understanding of the European Commission (2001) and the UK House of Lords (2000)? And can this be overcome through increased public participation?

According to Brian Wynne (2006) the problem of distrust of the sciences can at least partly be ascribed to a lack of self-reflexivity within the scientific institutions, and in particular those affiliated with government, regarding the institutional culture which habitually constructs the public as deficit in some way or another; which does not allow for real two-way dialogue but attempts to manipulate 'the public' into believing that scientific interpretations of the issues at stake are 'true'; which seems unable to recognise the legitimacy of public concerns relating to the body-language of scientific institutions, which refers to way science is institutionalised, owned and controlled, but also how members of science institutions perceive themselves as being part of these institutions, and finally that this failure contributes to public mistrust, and ultimately also to forms of public involvement that rather serves to legitimise status quo than to genuinely include people in decision-making (Wynne, 2006).

This interpretation is partly supported by Young and Matthews (2007), who investigated expert's understanding of the public in Canadian aquaculture and conclude that experts are supportive of public involvement only when they control knowledge, that the input of local knowledge is seen as secondary to scientific data and that stakeholder involvement is seen as contributing to the legitimacy of expert practises and findings rather than making a substantive contribution. I.e. in the Canadian case, practises are science centred, and the experts apparently think this beyond questioning. Furthermore they found a prevalent perception among experts of the general public being vulnerable to 'inaccurate' media representations of scientific facts (Young and Matthews, 2007).

The point is that even if the causes of public mistrust in certain scientific and political institutions as defined by those institutions themselves are valid, they are not the only causes. The self-perception of these institutions as providers of more accurate, superior knowledge and the implicit construction of the lay contributions as secondary and inferior contribute to public scepticism towards scientific institutions. Thereby not said that scientific knowledge is never superior, and should never be treated as such; on the contrary, scientific experts do not come into existence without having something special to offer, but only to answer and ask *some* questions. And the management of our common natural resources is never confined to just these questions. Wynne (2003, 2006) has a point when he claims that scientific and political institutions need to become more self-reflexive of their role. What need to be addressed in order to democratise¹ science based politics are the relations between policy-makers, citizens and scientific institutions (Hagendijk, 2004). I.e. trust as such is not the main issue in the public-science relationship. As I will argue in the following, the main issue is rather the construction of 'science' and 'society' as distinctly separate entities.

The mistaken construction of science and society as separate entities

Ulrich Beck (1997) and Anthony Giddens (1994) have made us aware that science is deeply entrenched in western society – i.e. science is part of society. Ethnographic approaches to the science-society relationship have shown that scientific endeavours are born, develop and applied in a societal, value laden context – i.e. society is part of science. In every controversy over new scientific developments societal elements and scientific elements are mixed and performative in

¹ Needless to say, this depends on what one understands by democratising. Very simply put, in this paper is believed that the better opportunities and the more liberty citizens have to directly be part of and control the decisions which affect their lives, the more democratic those decisions are.

relation to each other (Irwin and Michael, 2003). Nonetheless, science and society are constructed as separate entities in policy papers (e.g. UK House of Lords, 2000) and makes a complex relationship overly simple, thus blinding us to what link scientific and societal elements and that meanings are co-constructed in the interplay of these elements (Latour, 2004; Irwin and Michael, 2003).

The inseparability of science and society is clear when considering the individual actors which science-society consists of. Being a scientist, or a citizen, or a consumer or a representative of an interest organisation is a constructed and enacted identity which can simultaneously be embodied in the same individual (Irwin and Michael, 2003). Frank Fischer points to this when he tries to reconstruct scientific experts as “specialised citizens” since they are themselves “only members of the public when it comes to other areas of expertise” (Fischer, 2000, p. 35). Sonja Boehmer-Christiansen observes that even within their own area of expertise, scientists are not distinct from other members of society:

“When it comes to the evaluation of scientific evidence with regard to managing problems afflicted by value choices and unpredictability, scientists differ little from anybody else and their judgements will reflect prevailing opinion and fashion rather than knowledge” (Boehmer-Christiansen, 1994p. 84).

Brown and Michael (2001) found that scientists routinely switches between scientific and public identities when arguing and explaining scientific projects, which in this case was xenotransplantation.

Latour (2004) uses Plato’s image of the cave to illustrate what is wrong with constructing science and society as separate: members of society are caught in the cave, ignorant and unacquainted with nature, the external reality, which only the select few scientists have access to and therefore have authority to define. This short-circuits democracy as the ignorant are passively waiting to be saved by science without access to the real in any other form as presented by science. The ignorant only have subjectivity and opinion. While the image is extreme, it illustrates the point: that there is a need to reconstruct the science-society separation, which now seems almost ludicrous, in order to have a model which is more in accordance with experienced reality. Not least, because it is the separation of the science from society which enables the separation of facts from values.

The separation of facts belonging to scientists and values belonging to the lay citizens

Both the European Commission's white paper on governance and the Science and Society report by the House of Lords maintain that problems regarding the environment, health care etc. are to be solved rationally by means of the best science available (European Commission, 2001; UK House of Lords, 2000), i.e. problems are constructed as first and foremost scientific but containing other, separable issues such as ethics and values. Furthermore, it is implicitly maintained that science is rational as opposed to public concerns (Wynne, 2006; Irwin, 2001).

If we focus on environmental issues and read policy documents from this field in light of the above, e.g. the UN convention on access to information, public participation in decision-making and access to justice in environmental matters, it seems to speak with two voices. The preamble states:

“Recognizing also that every person has the right to live in an environment adequate to his or her health and well-being, and the duty, both individually and in association with others, to protect and improve the environment for the benefit of present and future generations,

Considering that, to be able to assert this right and observe this duty, citizens must have access to information, be entitled to participate in decision-making and have access to justice in environmental matters, and acknowledging in this regard that citizens may need assistance in order to exercise their rights,

Recognizing that, in the field of the environment, improved access to information and public participation in decision-making enhance the quality and the implementation of decisions, contribute to public awareness of environmental issues, give the public the opportunity to express its concerns and enable public authorities to take due account of such concerns,

Aiming thereby to further the accountability of and transparency in decision-making and to strengthen public support for decisions on the environment ...

Convinced that the implementation of this convention will strengthen democracy” (United Nations, 1998)

On the one hand participation is considered necessary for citizens to exercise their rights and duties to ensure sustainability, and thus may be interpreted as a tool of self-governance in the sense that people are to secure an adequate environment for themselves and future generations through political activity. I.e. participation supports democracy as ‘rule by the people’. Moreover, participation is claimed to improve the quality of policies.

However, the claim that participation qualifies policies is less clear when the preamble further states that citizens need assistance to exercise their rights and observe their duties, that participation is

meant to inform citizens and create awareness, that participation is a matter of expressing concerns, of enabling public authorities and to strengthen support for policies. Rather than ‘rule by the people’ these expressions points to a conception of democracy as ‘rule for the people’ where participation serves to inform public authorities, which can then make decisions where (irrational) public concerns are incorporated into the further (rational) decision-making process based on expertise.

Thus when members of the public are asked to participate in the policy process it is not to deliberate on the ‘facts’ but to inform policy-makers and scientists of public values and (emotional) concerns (Young and Matthews, 2007; Irwin and Michael, 2003; Wynne, 2003). Efforts to involve the public

“are not substitutes for decision-making, but aids to it. They help the decision-makers to listen and respond promptly to public values and concerns; and they give the public some assurance that their views are taken into account, increasing the chance that decisions will find acceptance” (UK House of Lords, 2000, chapter 5, 5.38).

So despite that scientific policy contributions are contingent upon the institutional body-language of the involved parties (e.g. Wynne, 2003; Boehmer-Christiansen, 1994) and as much about boundary construction and negotiating scientific differences than providing ‘pure’ scientific knowledge (e.g. Jasanoff, 1990), the sciences are enacted as providers of ‘facts’ and superior knowledge in policy processes, and thus given a privileged position compared to members of the publics who contribute with (only) values (Irwin and Michael, 2003). This separation of facts as belonging to the sciences and values as belonging to the publics blinds scientific institutions and policy makers to their own role in creating public opposition towards science and it resurrects the perception of the public as being cognitively deficit (Wynne, 2007; Wynne, 2006).

Latour (2004) opposes to the fact-value because the authoritative use of ‘facts’

“completely obscures the immense diversity of scientific activity that obliges all facts, in every stage of their production to become fixed, as if they had already reached their definitive state. ... [and] does not allow us to emphasize the work of theory that is necessary for the establishment of the coherence of the data” (Latour, 2004, p. 96).

Values suffer from the problem, that they can only be derived after ‘the facts’, only then can judgements be made of their desirability, but by then judgements are already made, however, without due process. The distinction hence enables the sciences and power-holders to short-circuit the political process by claiming indisputability of something uncertain (Latour, 2004).

The persistence of the fact-value distinction can partly be ascribed to political elites holding on to political power. Political and scientific elites benefit from the construction of science as provider of facts: scientific elites can claim authority and privilege in political regulation and political elites can legitimise policy and consolidate power (Jasanoff, 1987). Wynne (2003) sees science as the present culture of politics, which allows for scientific interpretations to be the only relevant interpretations for policy-makers. Boehmer-Christiansen interprets the political role of scientific authority along similar lines:

When power has no other authority for defending a policy to the public, then the politician can always claim that he is acting on the basis of scientific advice... Social choices are then dressed up as scientific ones and the claim that science and reason, rather than power and interest rule, can be made” (Boehmer-Christiansen, 1994, pp.76, 79),

I.e. this political function of scientific knowledge makes it important for policy makers as well as scientific institutions that science is perceived to have cognitive authority in the political processes they inform.

Latour (2004) further opposes the distinction because both ‘facts’ and ‘values’ try to combine contradictory political functions in one concept. The ‘facts’ side of the divide serves both to discover what is new, and question what is known, - to introduce propositions² into the collective *and* to close down discussions by coming to an agreement of what is known, - to institute the proposition in the collective. The ‘values’ side of the divide tries to embody the two functions of extending the involved range of stakeholders, so that all that ought to be consulted are consulted, *and* secondly to prioritise and establish a hierarchy among the propositions that are included in the collective. Instead of a distinction between facts and values, Latour proposes a distinction between *the power of taking into account*, to which the functions of introducing propositions and actors into the collective belong, and *the power to put in order*, which includes the functions of instituting propositions and establish hierarchy (Latour, 2004). See figure 1 below.

Summing up, the separation of facts and values consolidates existing power distributions in decision-making as it places scientific contributions as primary for decision-making, and simultaneously constructs public concerns as value-based, emotional and irrational and hence

² Propositions are in Latour’s (2004) terminology are associations of human and non-humans before they become instituted as agreed upon realities of the collective. They substitute subjects and objects, they are not true or false but well or badly articulated, and they indicate uncertainty. “I am going to say that a river, a troop of elephants, a climate, El Niño, a mayor, a town, a park, have to be taken as propositions to the collective.” (Latour, 2004, p 83), which the collective will decide to include or exclude depending on how convincingly it is articulated.

dismissible in a culture where rational decision-making is a virtue, and the only legitimate arguments are scientific. The separation of facts and values are in this light a convenient but unmanageable construction for existing scientific and political institutions favouring technocracy over democracy.

The need to reconstruct the science-society relationship

There are no easy solutions regarding how to make regulation and policy-making more democratic, but a first step is for scientific and political elites to recognise that they try to gain public support under false assumptions, give up the ideal of rational decision making and adjust to the complex relations they are part of. There is a need to re-construct what is a proper relationship between scientific institutions, citizens, interest groups, regulators and our natural and cultural environment. The models that construct ‘science’ and ‘society’ as separate entities have become obsolete in a world, where information travels fast and is picked up among both scientists and lay, and everyone can find abundant information on the internet to support their case, international organisations and companies organise people and issues across national or local boundaries and controversies over scientific developments are performed by heterogeneous groupings of a wide variety of actors. In such a world it is meaningless to hold on to old analytical distinctions between science and a lay society, between facts and values as separable entities, to construct the publics as deficient and to keep the sciences in an ivory tower of false objectivity and rationality, thus giving scientific institutions a technocratic authority which alienates them from society.

However, scientific expertise is a hard-earned political currency always in demand in a technology entrenched and increasingly complex society (Beck, 1997), and it is therefore naïve to think that scientific institutions will not remain in some sort of privileged position in the struggle for political influence. From a normative perspective in some ways the sciences should have a special position as they do possess specialized knowledge of substantive value to policy-making, but

“Rather than beginning with the ‘facts’ and fitting ‘politics and values’ around these, it becomes important to place scientific issues in their full cultural context from the beginning” (Irwin and Michael, 2003, p. 149).

This means that the ideal of ‘rational decision-making’ must be abandoned in favour of a more comprehensive model that embraces heterogeneity and dynamic links between society and the sciences.

There are several ideas available in the literature to aid us in how to reconstruct the science-society relationship in such a way. Starting with the least radical, Collins and Evans (2002) propose a re-categorising of what is legitimate expertise that can qualify decision-making in a way that transcends the traditional science-society divide. One still needs to be able to distinguish between an expert and a non-expert, but this should not be done as a boundary between a class of certified, professional experts and the rest, but between a group of specialists, certified and not, and the rest. In order for the contributions of the non-scientific experts not to be dismissed by the scientists there needs to be someone present with interactive expertise to pave the way for constructive interaction. New institutions may very well be needed to translate different types of expertise. Furthermore, scientist should only be included when they are specialists of the subject under debate, not as generalists. Furthermore Collins and Evans (2002) still wish to distinguish the technical from the political, as the claim of involvement from those with contributory expertise, certified or not, is of a different nature than the claim from stakeholders, and dissolving this distinction will lead to a problem of extension, where there is no way to discriminate contributory input from non-contributory.

Hajer (1995) proposes to consider environmental policy-making as a collective of discourse coalitions, which highlights the co-construction of knowledge claims from a variety of sources by means of story-lines where elements of many different domains are combined and which serve to reduce the discursive complexity in the interplay between scientists, environmentalists, lobbyists, politicians and other citizens. The power of a story-line resides in it 'sounding right' which is influenced by the argument in it self, the practise in which it is produced and the level of trust in the author. Story-lines are means by which to cluster knowledge and ultimately to form discourse coalitions. Discourse coalitions are formed by actively relating previously independent practises, which will then get meaning from a common political project. In terms of reconstruction the science-society divide, looking at the political as comprised of discourse coalitions implies that we must look for the political in different locations, namely in the production of story-lines, that is the actors that participates and how they relate to one another and the practises in which it takes place (Hajer, 1995)

Or one could take it a step further into ethno-epistemic assemblages, which adds further dimensions to science-society links such as the non-human actors and the variety and plurality of links that holds the assemblages together beyond story-lines and discourses. Understanding the science-society relations as ethno-epistemic assemblage can sensitize us to the performative nature of how

knowledge is co-constructed. Assemblages are all about blurring and mixing, they are not fixed entities; they form, grow and dissolve again. They have scientific elements and lay elements. Identities are fluid; they are enacted and performed upon, responding to local traditions, global influences, events, values, information, developments etc. (Irwin and Michael, 2003). Clearly, the blurring and mixing of traditional categories and understanding is also its weakness as an analytical tool, as it makes it difficult to handle.

Latour (2004) proposes the following model: instead of ‘the old constitution’ with the two houses: nature and society, there should be a new republic divided according to two new houses: the powers of taking into account and the power to put in order which together defines the collective.

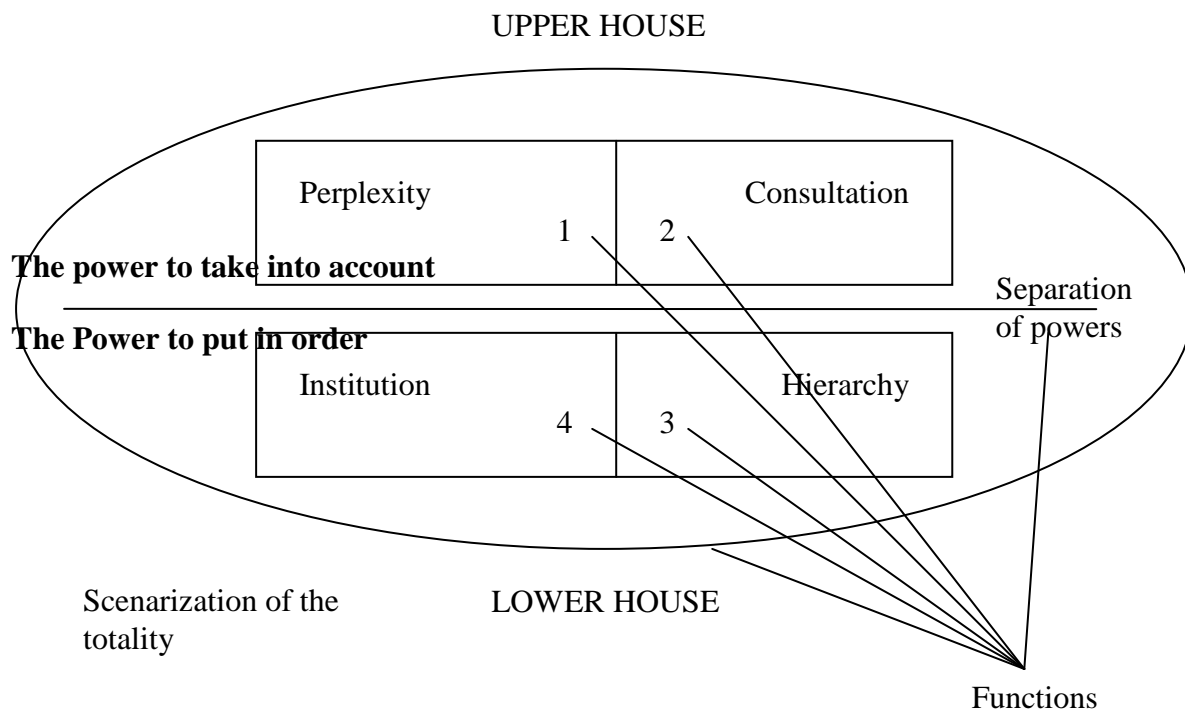


Figure 1. The new republic (from Latour, 2004)

The members of the collective bring different contributions to the 6 functions of the republic: 1) adding to perplexity, 2) ensuring consultation, 3) creating hierarchy among propositions, 4) institutionalise propositions, 5) maintain the separation of the two powers and finally 6) the scenarization of the collective in a unity by exclusion of propositions. For example can scientists by means of their particular skills contribute to perplexity by making “the world speak” (Latour, 2004, p. 137) with the help from theory and scientific discovery and hereby create new perspectives through which to understand the world. They contribute to consultation by means of controversy and experimental testing; they contribute to hierarchical ordering by opening up the realm of the

possible through innovations which may entirely shift the criteria of value judgements. The sciences contribute to the function of institution by coming to consensus and thereby they contribute to the stability of the collective by bringing definitive and durable closure to controversy, but unlike before, this is done after due process of consultation and political judgement necessary to establish hierarchy. As for the separation of powers, scientists can contribute by defending autonomy to ask their own questions, but this autonomy is the right of everyone, not just the sciences. The sciences contribute to the sixth function of scenarization through their ability to create unifying narratives such as the big bang, etc. So essentially, the sciences can do what they have always done, but the difference is that they are constructed differently, not as creators of indisputable fact, but as contributors to political processes at all its stages collaborating with politicians, economists, moralists who all have their share in the same 6 functions. The collective creates a new exteriority of the totality of what has been excluded in the explicit process of putting in order, but an exterior that is not negated as non-factual, but propositions that at any time in the future may be taken into account again. This succession of stages then makes the sciences compatible with democracy (Latour, 2004).

What then, can we learn from all this in terms of making science-dependent environmental policy making more democratic? At least that environmental managers, with or without specialist knowledge, need to be in open communication with society in a manner that does not construct science contributions as apolitical carriers of indisputable facts. This may require institutional reform (Collins and Evans, 2002; Boehmer-Christiansen, 1994). Integrating sciences, politics and experiences through story lines, ethno-epistemic assemblages or through the functions of Latour's republic can only occur if there are forums where dialogue, deliberation and contestation can take place.

In the following I consider if governance networks, where a multitude of different actors negotiate for a public purpose may be able to constitute such forums.

Governance networks as venues for reconstruction of the science-policy relationship

From the above it should now be clear that the authoritative position scientific institutions have in policy-making and regulation rests on a mistaken construction of the sciences as provider of undisputable 'facts', but a construction that despite repeated criticism has persisted. Keeping the power-consolidating function of this construction in mind, its viability makes sense, but cracks are

beginning to show. The persistent demand for more and better public involvement in decision-making (Hagedijk, 2004; Fischer, 2000) is one of these cracks. The rise of new modes of governance, such as the establishment of governance networks as supplements to governments (Sørensen and Torfing, 2007; Pierre, 2000; Rhodes, 1996) is another.

In order to democratise science and overcome the barriers to communication between different holders of knowledge they should be able to meet and negotiate in some sort of boundary organisation (Cash et al, 2002), the question is if governance networks can be such organisations and where the boundary is, that they need to bridge?

The rise of governance networks is a response to increased societal complexity which the bureaucratically steered nation state is unable to manage without the input from a plurality of diverse public and private actors (e.g. Marcussen and Torfing, 2007; Benz and Papadopoulos, 2006; Kooiman, 2003). Governance networks bring together, in a more or less institutionalised form, a variety of actors with different resources, different experiences and knowledge in order to address a public issue (Sørensen and Torfing, 2005). Ideally, they should thus be able to provide better tailored, more comprehensive and also more legitimate policies for complex problems (Hendriks, 2008; Klijn and Skelcher, 2007). However, this requires that the network participants do in fact have the necessary resources; that they are willing to employ them; that they are able to overcome internal conflict and collaborate; and that they are accountable towards those affected by their decisions. This will by no means always be the case, but skilled network management or metagovernance may mitigate the problems (Klijn, 2005; Agranoff and McGuire, 2001; Kickert et al, 1997).

In terms of being boundary organisations to bridge the science-society divide they do hold some promise because: 1) they by definition are venues where different cultures meet, 2) they aim to reconcile and integrate knowledge from different sources, and 3) debate, contestation, negotiation and deliberation is the mode of interaction. Relating to Collins and Evans (2002) governance networks could very well be institutions where different types of knowledge are translated and where scientific contributory expertise can be fed into policy-making. Relating to Hajer (1995), over time governance networks could become coalitions where previously independent practises are brought together, story-lines develop and shared meaning is created regarding a common political project. Governance networks could be conceived as forums where propositions of human and non-

human actors are introduced and ordered into collective according to democratic process (Latour, 2004; Irwin and Michael, 2003). They could be.

However, in reality they have been places where existing power relations are consolidated among elites instead of democratised (Hendriks, 2008), decision-making is obscured and unaccountable (Papadopoulos, 2007; Greenaway et al, 2007), scientific experts are deliberately held external from deliberations and kept on tap (Lund et al, 2008), and where political elites seek to legitimise action by involving a variety of actors, but without genuinely giving decision-making power and thus influence to these actors (Bell and Park, 2006). So much work still needs to be done before governance networks become forums where expertise of different types is integrated in a collaborative and democratic manner that places the sciences at its rightful place entangled with society and facts “in their full cultural context from the beginning” (Irwin and Michael, 2003, p. 149).

From the above, I hope to have asserted that it could be a fruitful (and challenging) endeavour for scholars and practitioner to explore the links between actual governance networks and abstracts conceptions of the links between the sciences, society and our natural environment further with the aim to democratise science dependent environmental policy-making.

Conclusion

In the above I have engaged with the some of the literature deconstructing and reconstructing the relationship between the sciences, the publics and policy-makers with the aim to explore links to governance networks and their ability to be venues for a more democratic involvement of the sciences in environmental policy-making.

From the deconstructive strands of science and technology studies it is clear that the prevalent conception of facts and values as distinct and separable entities is largely misguided, and implicitly constructs the publics as deficient in some way or another, whereas the sciences (falsely) remain authoritative sources of objective facts. This need to be remedied. From the reconstructive strands of science and technology studies we can find some ideas to re-conceptualize the science-society divide, but these need to be brought ‘down to earth’ from a high abstraction level to be practically applicable. I propose that a further reconstruction of the relationship between the sciences, society and nature can fruitfully take place within studies of new modes of governance and specifically

governance networks as some sort of boundary organisations. But it is a challenging endeavour, where much work still remains to be done.

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